

Critical Issues and Objectives for NASA Earth Science and Applications from Space

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Scientific Challenges for Solid Earth Science

ESE Goal and Leading Solid Earth Science Questions (2000)

Observe, understand, and model the Earth system to learn how it is changing and the consequences for life on Earth.

How is the Earth's surface being transformed and how can such information be used to predict future changes? What are the motions of the Earth and the Earth's interior, and what information can be inferred about Earth's internal processes?

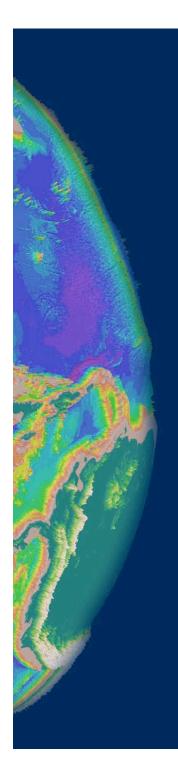
Scientific Challenges Identified by the SESWG (2002)

- 1. What is the nature of deformation at plate boundaries and what are the implications for earthquake hazards?
- 2. How do tectonics and climate interact to shape the Earth's surface and create natural hazards?
- 3. What are the interactions among ice masses, oceans, and the solid Earth and their implications for sea level change?

- 4. How do magmatic systems evolve and under what conditions do volcanoes erupt?
- 5. What are the dynamics of the mantle and crust and how does the Earth's surface respond?
- 6. What are the dynamics of the Earth's magnetic field and its interactions with the Earth system?

Technology Development Recommended by SESWG

Regional surfa deformation r (ERS-2)		surface deformation EO InSAR)	Daily surface d maps (LEO, InS constellation)	leformation AR wide-swath	Hourly to continuous surface deformation maps (GEO or constellation InSAR)	
The state of the s	AMP)		Global	gravity mapping with km resolution	Global gravity mapping few-km resolution Magnetometer constellar (12 satellites)	tion al-scale
	tral imaging		i/N ratio spectral imaging	Wide-swath hype		ive propogation ic tomography
Laser altir	metry (ICESat)			Wide-swath laser altimeter/lidar scannin	50-200 MHz low-frequency sounders for subsurfa	
Space-based I technology de lonospheric algorithms	correction Au for InSAR sate	Wide-ang	proved microwave gle hyperspectral infrared airborne eter demonstration	Airborne I	ow frequency Hz) sounder demonstration lified quantum magnetometer	
	agnetometer raft with	Formation flying Autonomous navig On-board, high-rat	\$1000000000000000000000000000000000000	Quan	tum gravity gradiometer	
	veight antennas h) Ultra-high data		ptics for laser inte nas/ Lightweig inflatable optical comm)	erometry ght antennas/ s/mesh (~30 m)	mmunications (optical comm)	



Critical Programmatic Issues



- Leveraging partnerships with other federal agencies (e.g., NOAA, NSF, USGS, DOD).
- Leveraging partnerships with international space agencies (e.g., GRACE, Oersted, CHAMP, SAC-C, Radarsat).
- Integrating technology development opportunities across Earth and space sciences.
- Balancing technological innovation with need for long-term program of synoptic and commandable targeted observations.
- Balancing mission programs with continuing need for investment in R&A, IT, technology, supporting infrastructure, and E/PO.